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ODEL 108A

SIERRA ELECTRONIC CORPORATION

SAN CARLOS, CALIFORNIA, U.S.A.

INSTRUCTION MANUAL

CARRIER FREQUENCY VOLTMETER

MODEL 108A

Serial Numbers 102 -111

Manufactured by

SIERRA ELECTRONIC CORPORATION

1050 Brittan Avenue
San Carlos, California

WARRANTY FOR RADIO AND TELEVISION INSTRUMENTS AND TEST EQUIPMENT

SIERRA ELECTRONIC CORPORATION warrants instruments manufactured by it to be free from defective material or factory workmanship and agrees to repair such instruments, which under normal use and service, disclose the defect to be the fault of our manufacturing. Our obligation under this warranty is limited to repairing any instrument or test equipment which proves to be defective, when returned to us, transportation prepaid, within ninety (90) days from the date of original purchase.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons or service stations in any way so as, in our judgment, to injure their stability or reliability or which have been subject to misuse, negligence, or accident, or which have had the serial number altered, effaced, or removed. Neither does this warranty apply to any of our products which have been connected, installed, or adjusted otherwise than in accordance with the instructions furnished by us. Accessories, including all vacuum tubes, not of our manufacture used with this product are not covered by this warranty.

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This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our products.

CARRIER FREQUENCY VOLTMETER
MODEL S 05A
SIERRA ELECTRONIC CORPORATION
SAN CARLOS, CALIF.
ATTENUATOR
KC.
DECIBELS
VOLTS
Sierra Electronic Corporation
SAN CARLOS, CALIF.
AUD. GAIN
CAL. 2
(I.F. GAIN)
OFF
PHONES
CAL. 2
(100 KC)
CAL. 1
MEAS.
METER
UNBAL.
G
BAL. 135 Ω
BAL.
UNBAL.

FIG. 1

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SUMMARY OF TECHNICAL SPECIFICATIONS

Power Input	105-125 volts, 60 cycles, 80 voltamperes
Fuse Protection	2 amperes
Frequency Range	15 to 500 kc
Input Level Range	-80 to +42 dbm
Selectivity	
1. 3 db down	±600 cps
2. 45 db down	±3000 cps
Voltage Measuring Accuracy	±2 db over range -70 to +42 dbm
Input Impedance for Direct Reading in dbm	135 ohms balanced and 600 ohms unbalanced
Frequency Accuracy	±3 kc over range, 45°F to 90°F ambient
Overall Dimensions	
Width	17"
Height	9-1/16"
Depth	13-1/2"
Weight	35 pounds

OPERATING AND MAINTENANCE INSTRUCTIONS

for

MODEL 108A CARRIER FREQUENCY VOLTMETER

1. GENERAL

The Sierra Model 108A Carrier Frequency Voltmeter is designed to measure voltages in the frequency range of 15 kc to 500 kc. It is a selective detector with a high impedance input and is direct reading in dbm when bridged across either 135-ohm balanced or 600-ohm unbalanced circuits. A variable attenuator and an indicating meter provide a sensitivity range of -80 dbm to +42 dbm. The attenuator and meter are also calibrated in voltage. For restrictions on use of voltage scale see paragraph on page 2 entitled DECIBELS METER. A jack is provided for monitoring the incoming signal with headphones.

The voltmeter is equipped with an injection oscillator, which is in effect a signal generator, for the purpose of calibrating its sensitivity to input voltages.

2. DESCRIPTION

The front view of the Carrier Frequency Voltmeter is shown in Fig. 1. A block diagram (Fig. 2) is included to help the user understand the functions of the voltmeter. The circuit schematic is shown on drawing E-4286-4, attached.

Input Circuit

The BAL. -UNBAL. switch provides for the selection of the proper input terminals to be used. For bridging measurements on 600-ohm unbalanced circuits the UNBAL. position is used and connection is made to the UNBAL. -G binding posts. For bridging measurements on 135-ohm balanced circuits the BAL. position of the switch is used and connection is made to the BAL. 135Ω binding posts. This connection utilizes the built-in transformer T7 to provide the balanced input facility.

The signal input then passes through a section which includes the variable ATTENUATOR and an input filter before reaching the grid of the first converter. The input filter has a pass band from 15 kc to 500 kc. Its purpose is to suppress all signals outside of this band. The variable ATTENUATOR merely reduces by known amounts the signal arriving at the grid of the first converter, so as to increase the voltage measuring range of the instrument and make possible the measurement of relatively large voltages. The ATTENUATOR steps are in 10 db intervals. The pads for steps between +40 and +10 are connected ahead of the band pass filter, those between -60 and +10 follow the filter.

Converter Circuits

The tuning dial on the front of the voltmeter indicates the signal input

frequency directly in kc and controls the frequency of a variable frequency oscillator over a range of 1125 kc to 1610 kc. The output of this oscillator combines with the incoming signal in the first converter to produce an intermediate frequency (I.F) of 1110 kc. The CAL 2 (I.F. GAIN) control is provided for adjusting the gain of the voltmeter. Likewise, the 1110 kc signal, after passing through the I.F. amplifier, combines in the second converter with the 1028 kc crystal-controlled oscillator frequency to produce a second intermediate frequency of 82 kc. The output of the 82 kc amplifier goes directly into the crystal detector, the dc output of which operates the DECIBELS meter.

DECIBELS Meter

The output indicating meter has a 0-200 microampere range, but the scale is calibrated in both decibels and volts. The meter calibration in conjunction with the calibrations on the attenuator dial indicate the voltage levels at the probe input terminal. The instrument calibrations are based one one milliwatt dissipated in 600 ohms, recognized as 0 dbm. The voltage appearing across the resistor is 0.775 volts, rms. With the ATTENUATOR set at 0 db or 1 the DECIBELS METER will show 0 db or 0.775 volts when 0.775 volts is applied between the input probe terminal and ground.

Injection Oscillator

An injection oscillator, which operates at 100 kc, is included in the voltmeter. This oscillator provides a fixed amplitude signal which can be switched to the input circuit and substituted for the incoming signal for calibration purposes. When the METER switch is placed in the CAL 1 or CAL 2 position the band pass filter terminals are switched from the input switching circuit to the injection oscillator output. At the same time the plate voltage is connected to the injection oscillator.

The injection oscillator circuit contains a vacuum tube voltmeter, for monitoring the amplitude of oscillations to insure an accurate injection signal amplitude. The dc output from this vacuum tube voltmeter is shown on the DECIBELS meter when the METER switch is in the CAL 1 position. This circuit is adjusted for an indication of 0 db when operating properly.

Listening Jack

A PHONES Jack is provided on the front panel for the use of a

headset, to listen to the incoming signals. The headset is energized from an audio amplifier, the audio level of which is adjustable from the AUD. GAIN control on the front panel.

Regulated Voltage

The dc voltages used in the voltmeter are regulated in the power supply section. The object of this arrangement is to insure relatively constant voltage in the instrument under conditions where the 115 V supply is not constant. An adjustment is provided for setting the B supply voltage at its nominal 225 volt value.

Supply Voltage and Power

This voltmeter is designed to operate from a main supply of 115 volts, 60 cycles. It will operate satisfactorily in the range from 105 volts to 125 volts. The Power Switch is incorporated in the AUD. GAIN control, turn clockwise for on position. The power drain is approximately 80 voltamperes.

Dimensions and Weight

The overall dimensions of the unit are: 13-1/2" deep (over handles) by 17" wide by 9-1/16" high, including rubber feet. The weight is approximately 35 pounds.

3. PERFORMANCE

Sensitivity

The voltmeter is capable of measuring voltages equivalent to -70 dbm to +42 dbm in either 135-ohm balanced or 600-ohm unbalanced circuits using the DECIBELS meter scale between -10 db and +2 db. The accuracy of any ATTENUATOR step from +10 db to -40 db is ±0.3 db at 100 kc. Typical curves of sensitivity vs frequency are shown in Fig. 3. Although the shapes of these frequency characteristics will change somewhat for different steps of the ATTENUATOR, and from set to set, the overall accuracy will be within the limits given below.

135-ohm Measurments

48 to 256 kc

±2 db for +40, -50 and -60 db steps

±1 db for +30 to -40 db steps

20 to 48 kc and 256 to 500 kc

±2 db for all steps

600-ohm Measurements
20 to 500 kc
±2 db for +40 to -40 db steps

Additional sensitivity down to -80 dbm may be obtained by using the portion of the DECIBELS meter scale between -10 and -20 db. However, these measurements will be less accurate.

Tuning Dial

The tuning dial is adjusted at the factory within ±3 kc in the ambient temperature range of 45° F to 90° F. At 68° F, the calibration is accurate to within ±1 kc over the frequency range 48 to 256 kc, when properly adjusted by means of the frequency alignment procedure given for the variable frequency oscillator in the MAINTENANCE section of this manual.

Selectivity

The selectivity characteristic of the voltmeter is approximately as follows: 9 db down at 1 kilocycle off resonance, 29 db down at 2 kilocycles off resonance, and 46 db down at 3 kilocycles off resonance. A typical selectivity curve is shown in Fig. 4.

CAL 2(I.F.GAIN) Control Range

The normal control range of the CAL 2(I.F.GAIN) adjustment is approximately 16 db and is adjusted at the factory to approximately 8 db above and 8 db below the 0 db mark on the DECIBELS meter.

4. OPERATION

Calibration Using Injection Oscillator

The injection oscillator is adjusted at the factory to give maximum accuracy for calibrating the voltmeter gain for use on 135-ohm balanced to ground measurements. The calibration obtained will be satisfactory although slightly less accurate for measurements on 600-ohm unbalanced to ground circuits. If greater accuracy is desired for these measurements, the voltmeter may be calibrated using an external source.

To use the injection oscillator for calibration (after voltmeter has been turned on for at least 20 minutes):

1. Place the METER switch in the CAL 1 position. The DECIBELS meter should show 0 db. If it does not, the oscillator should be adjusted in accordance with the Maintenance Section.

2. Operate the METER switch to the CAL 2 position and after setting the ATTENUATOR at 0 db adjust the tuning dial for maximum response on the DECIBELS meter at 100 kc. If the meter reading is not 0 db it should be so adjusted by the CAL 2 (I.F. GAIN) control knob.

   The sensitivity is now properly adjusted.

3. Operate the METER switch to the MEAS. position and proceed with measurements.

Calibration Using External Source

If it is desired to use an external source for sensitivity calibration, the following procedure should be followed:

1. Set up a 135-ohm balanced to ground test circuit consisting of an oscillator with a 135-ohm balanced output, a 135-ohm balanced attenuator and a 135-ohm termination. A 135-ohm thermocouple set is preferred for the termination but at the expense of some accuracy a 135-ohm resistance and vacuum tube voltmeter can be used.

2. At a frequency of 100 kc establish a power of 0 dbm (0.368 volt across the terminating resistance) in the termination.

3. Connect the voltmeter BAL. 135Ω binding posts to the 135-ohm termination. Set the BAL.-UNBAL. switch to the UNBAL. position and the METER switch to the MEASURE position. Do not make any adjustment of the external circuit after the voltmeter connection is made.

4. With the ATTENUATOR switch in the 0 db position asjust the tuning dial for a maximum DECIBELS meter reading and adjust the CAL 2 (I.F. GAIN) control for a 0 db meter reading.

With this adjustment complete the voltmeter is set at normal sensitivity. For general sensitivity adjustments the frequency used should be about 100 kc. However, for maximum accuracy this adjustment should be made in the region of the frequencies under measurement. Always make certain the tuning dial is set for maximum deflection.

If it is desired to calibrate the voltmeter for maximum accuracy for measurements on 600-ohm unbalanced circuits the above procedure may be followed using a 600-ohm unbalanced test circuit with a power of 0 dbm (0.775 volt) and with the BAL.-UNBAL. switch in the UNBAL. position. In this case the UNBAL.-G binding posts of the voltmeter are used.

Injection Oscillator Harmonics

The injection voltage is selected from a portion of the Injection Oscillator circuit which is rich in harmonics in order to produce DECIBELS meter deflections when the tuning dial is adjusted to the harmonics of 100 kc or to the 200 kc, 300 kc, 400 kc and 500 kc settings. This feature is provided for quick check of the tuning dial calibration.

CAUTION: Use only the 100 kc dial setting for injector calibration purposes since the harmonic voltage amplitudes are less than the 100 kc amplitude. A special calibration must be provided if injector calibration at harmonic frequencies is desired.

General Measuring Methods

1. Calibrate the voltmeter as described above using the injection oscillator or an external source as desired.

2. Set the BAL.-UNBAL. switch to the proper position for the type of measurement to be made and connect the voltmeter to the circuit to be measured. For measurements on 600-ohm unbalanced circuits set the switch to the UNBAL. position and make connection to the UNBAL.-G binding posts. The grounded side of the circuits should be connected to the G binding post. For measurements on 135-ohm balanced circuits set the switch to the BAL. 135Ω binding posts.

3. Adjust the tuning dial for a maximum DECIBELS meter reading at the frequency of the signal under measurement,

setting the ATTENUATOR switch as required to obtain the reading.

4. To obtain the magnitude of the signal in dbm add the reading of the ATTENUATOR algebraically to the meter reading.

Use of Headset

A headset may be used for listening to the incoming signals, by plugging into the PHONES jack. The audio level is adjustable from the control knob labeled AUD.GAIN. Headset resistance should be 2000 ohms or more, because lower resistance sets will not respond as well.

5. MAINTENANCE

General

The Carrier Frequency Voltmeter should require no maintenance during normal use except for occasional change of tubes and the removal of dust and dirt. The change of tubes will affect the sensitivity of the instrument and, therefore, it should be rechecked for sensitivity with either the injection oscillator or an external known source of voltage, preferably around 100 kc (see instructions above). If the sensitivity is low the voltmeter should be lined up as later described. Change of power supply tubes V10, V11 or V12 may require that the potentiometer "V" be readjusted to give a B Supply potential of 225 volts, as measured from pin 8 (cathode) of tube V10 to chassis ground.

Fuse

A fuse for the main supply is located on the rear of the chassis and is available for replacement by unscrewing the black cap marked FUSE. Replacement fuses should be rated at 2 amperes and be of the 3AG type.

Injection Oscillator

If the tube to be changed is the injection oscillator tube V7, the following steps should be followed after insertion of new tube and allowing at least a 20 minute warm-up period:

1. With the METER switch in the CAL.1 position, adjust Potentiometer shaft marked CAL 1 (located close to 5Y3 tube on upper side of chassis) with screwdriver to give 0 db reading on DECIBELS meter.

2. Operate the METER switch to the CAL 2 position and adjust frequency of injection oscillator to 100 kc by using screwdriver in slotted shaft marked "H" located close to 5Y3 tube on upper side of chassis. Tuning can be accomplished by direct beating of injection oscillator with external frequency source or by tuning the injection oscillator frequency for maximum deflection of DECIBELS meter when tuning dial is set to 100 kc - the latter 100 kc tuning dial point should be set from an external source (with METER switch in MEAS. position) to give better frequency accuracy.

3. After frequency of injection oscillator has been set, the DECIBELS meter should read 0 db after the voltmeter sensitivity has been properly adjusted by the CAL 2 (I.F.GAIN) control knob according to procedure given above under Calibration Using External Source using the 135-ohm balanced test circuit. If deflection on DECIBELS meter is not 0 db, the level can be adjusted by using a screwdriver in slotted potentiometer shaft marked "P" located near 5Y3 tube on upper side of chassis. This potentiometer is R42 on the schematic.

Variable Frequency Oscillator

In case it is necessary to change the oscillator tube V8 in the variable frequency oscillator (connected to the tuning dial), it may also be necessary to readjust the circuit constants so that the tuning dial numerals will correspond to the correct incoming signal frequencies. This adjustment is accomplished by connecting the voltmeter to an accurate 500 kc signal source, setting the tuning dial at 500 kc and adjusting the oscillator trimmer capacitor C34 for maximum DECIBELS meter deflection with screwdriver inserted in ceramic slot designated "O" on under side of chassis beneath variable oscillator housing.

If after the above adjustment has been made the tuning dial calibration is not within its limits (over the full range of 15 to 500 kc) the following additional procedure should be followed to track the variable oscillator with the tuning dial.

1. Feed an accurate 100 kc signal into the voltmeter, set tuning dial to 100 kc, and adjust oscillator inductor screw "X" (adjacent to the trimmer capacitor "O") for maximum response on the DECIBELS meter.

2. Go back to the 500 kc input signal frequency and tuning dial setting, and readjust capacitor "O".

3. Since there is a slight amount of interaction between the settings of "O" and "X", the above steps should be repeated two or three times more to arrive at the proper final settings for these adjustments.

4. The tuning dial calibration accuracy should now be within its limits over the full range of 15 to 500 kc.

First and Second Converters

In case the first converter tube V1 and/or second converter tube V3 is changed the adjustment of the C1 and/or C2 neutralizing condensers should be checked. With the METER switch in the MEAS. position but with no applied signal, set tuning dial at 250 kc and ATTENUATOR at "-60" db, and with a low-capacitance RF vacuum tube voltmeter (Hewlett-Packard 410A or B) connected from ATTENUATOR rotor lug to chassis ground, adjust C1 for a minimum reading of the V.T.V.M. on its 1 volt range. With the V.T.V.M. probe connected from grid #3 (pin 8) of V3 to chassis ground, adjust C2 for a minimum V.T.V.M. reading in the same manner. If the Hewlett-Packard 410A or B vacuum tube voltmeter is not available a Hewlett-Packard 400C or 400A type may be used with a 5 mmf capacitor in series with its high side.

Lineup Procedure

In the event it is necessary to electrically realign the voltmeter the following procedure is suggested.

82 kc IF Amplifier: Using a suitable signal generator with low impedance (approx. 15 ohms) unbalanced output apply .110 volts rms at 82 kc to grid No. 1 (Pin 4) on vacuum tube V4 socket and tune the IF transformer T5 for maximum response on the DECIBELS meter of the voltmeter. This operation should be performed with the METER switch in the MEAS. position.

The tuning of the IF transformers will require adjustment at both of the tuning screws extending from the side of the transformer shield. A suitable screwdriver is the only tool necessary for this procedure. When the alignment is complete the DECIBELS meter should stand at -1 db ±3 db.

Move the signal generator leads to vacuum tube V3 socket and apply .0032 volts rms at 82 kc between grid No. 3 (Pin8) and ground. Proceed as above and tune transformer T4 for maximum deflection of the DECIBELS meter. When this transformer is properly tuned the DECIBELS meter should stand at -2 db ±4 db.

Crystal Converter: With the signal generator left connected between grid No. 3 (Pin 8) and ground on vacuum tube V3 socket apply .0032 volts rms at 1110 kc. This procedure will serve to check the operation of this stage as a converter and the DECIBELS meter should indicate within 3 db of the reading obtained when 82 kc was applied to this same grid as described above.

1110 KC IF Amplifier: Move the signal generator leads to vacuum tube V2 socket and apply 710 microvolts rms at 1110 kc between grid No. 1 (Pin 4) and ground. Maximize the voltmeter output by adjusting the single top tuning screw of Transformer T3. With CAL 2(I.F.GAIN) control set for minimum gain (maximum counterclockwise position) the DECIBELS meter should stand at -3 db ±5 db.

Move the signal generator leads to vacuum tube V1 socket and, with the ATTENUATOR switch set to the "-40" position, apply 370 microvolts rms at 1110 kc between grid No. 3 (Pin 8) and ground. Proceed as above to tune the IF transformers T1 and T2 for maximum response on the DECIBELS meter. The CAL 2 (I.F.GAIN) control should be adjusted for a convenient deflection of the DECIBELS meter during this tuning process. Remove the signal generator connection.

First Converter: With the METER switch in the MEAS. position apply 0.775 volt rms at 100 kc to the UNBAL.-G binding posts. For this procedure the ATTENUATOR switch should be set to the 0 db position and the BAL.-UNBAL. switch to the UNBAL. position. Adjust the tuning dial for a maximum DECIBELS meter deflection. With the CAL 2(I.F.GAIN) control in its maximum counterclockwise position the DECIBELS meter reading should be between -10 db and -4 db. If the response falls short the 6SB7Y vacuum tube at V1 should be exchanged. This tube as received from the manufacturer is subject to wide variations in performance and it may be necessary to select a tube which will give the required response. If no tube is found to give the required response it may be

necessary to adjust the special coupling condenser C5 by bending the plates slightly (reducing the spacing) to increase the meter reading. If the meter reading above was too high the plates of condenser C5 may be bent slightly (increasing the spacing) to decrease the meter reading.

Over-all Check: When the above procedure has been completed the over-all sensitivity of the voltmeter should be checked with the use of suitable signal generator and attenuator facilities. For this purpose all measurements are referred to 0 db deflection on the DECIBELS meter at 100 kc on the tuning dial.

6. PARTS LIST

Sheets 1 to 12 of Electrical Parts List SA-4412-1 give the list of component parts used in the voltmeter.

108A
CARRIER FREQUENCY VOLTMETER

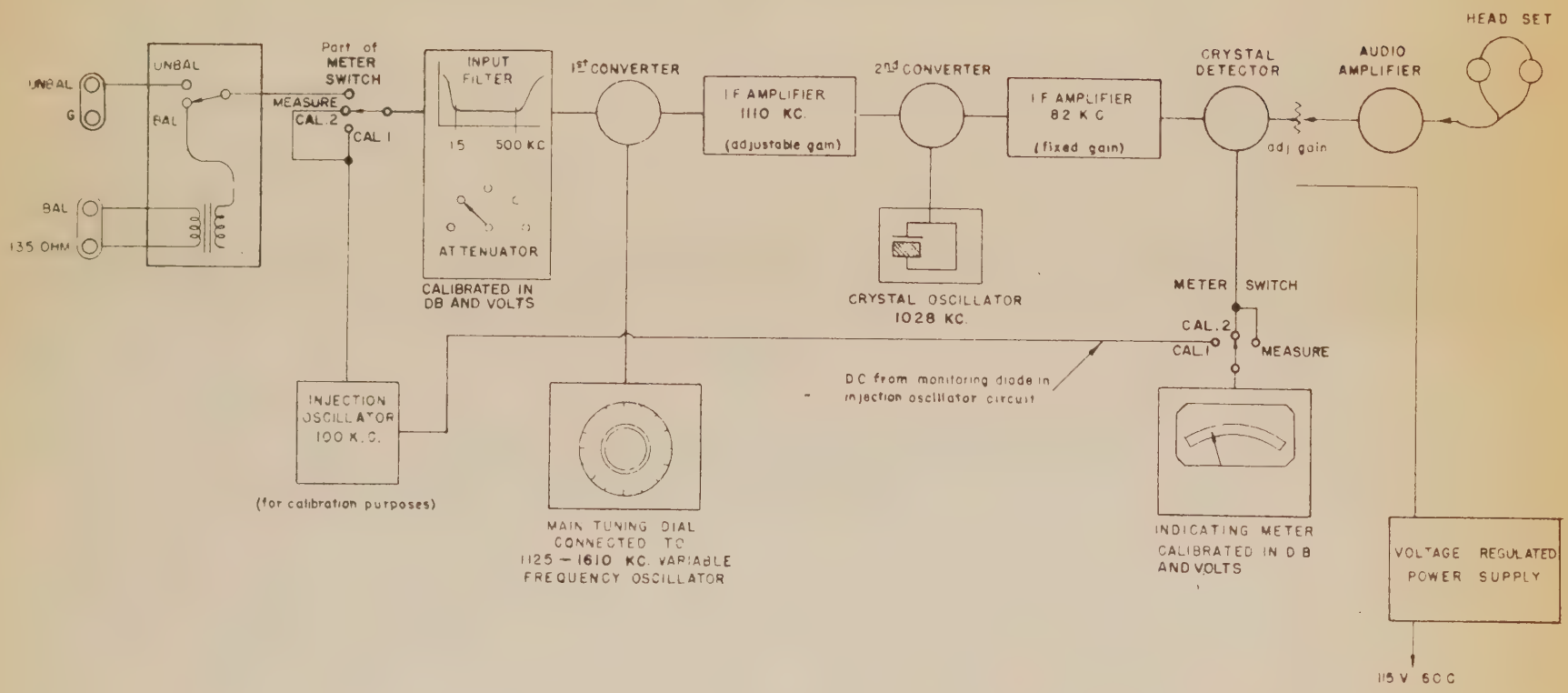


FIG. 2
BLOCK DIAGRAM

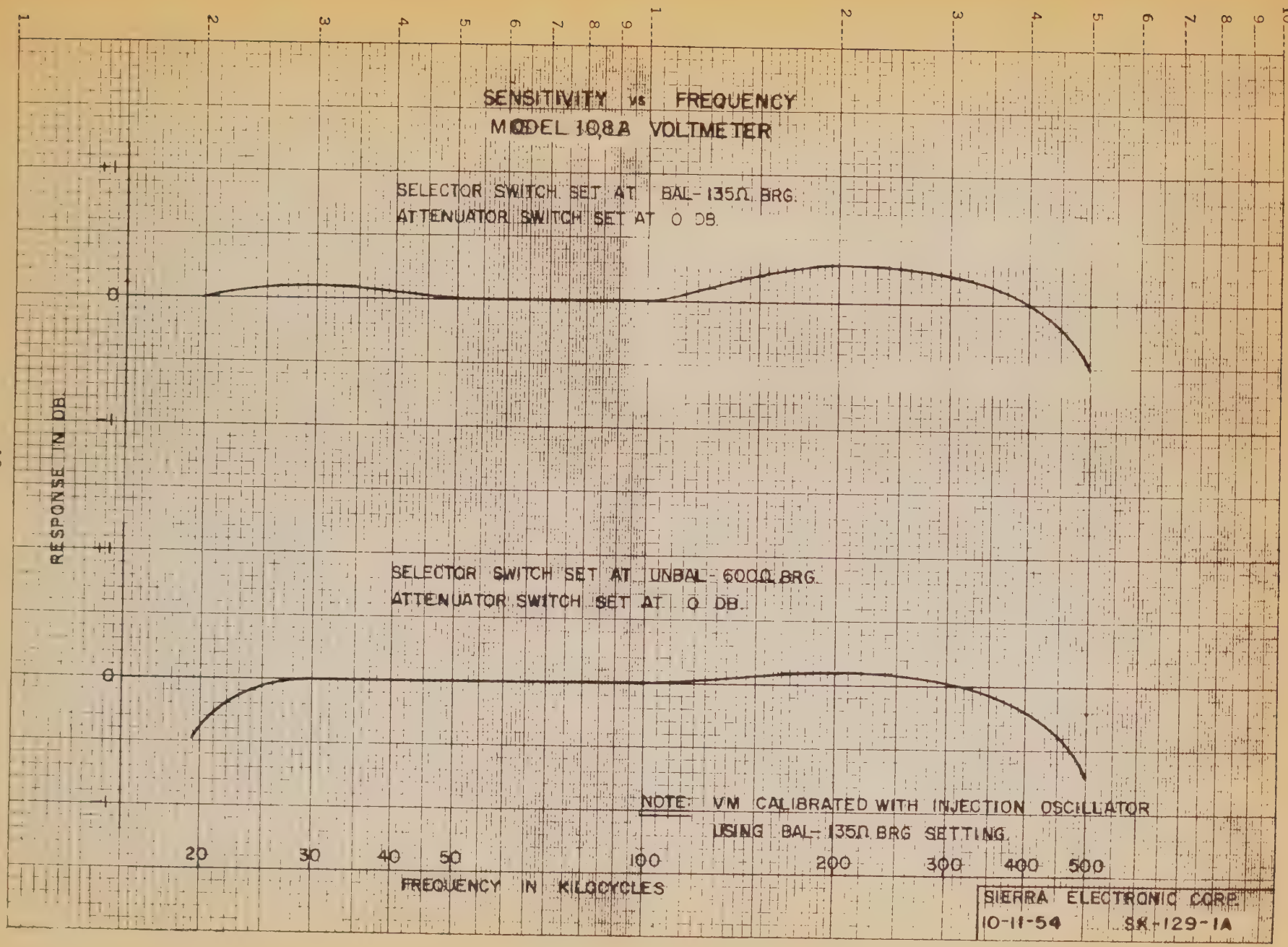

SENSITIVITY vs FREQUENCY
MODEL 108A VOLTMETER
SELECTOR SWITCH SET AT BAL-135Ω BRG.
ATTENUATOR SWITCH SET AT 0 DB.
SELECTOR SWITCH SET AT UNBAL-600Ω BRG.
ATTENUATOR SWITCH SET AT 0 DB.
RESPONSE IN DB
+
0
-
+
0
-
NOTE: VM CALIBRATED WITH INJECTION OSCILLATOR
USING BAL-135Ω BRG SETTING.
20 30 40 50 100 200 300 400 500
FREQUENCY IN KILOCYCLES
SIERRA ELECTRONIC CORP.
10-11-54 SK-129-1A

FIG. 3

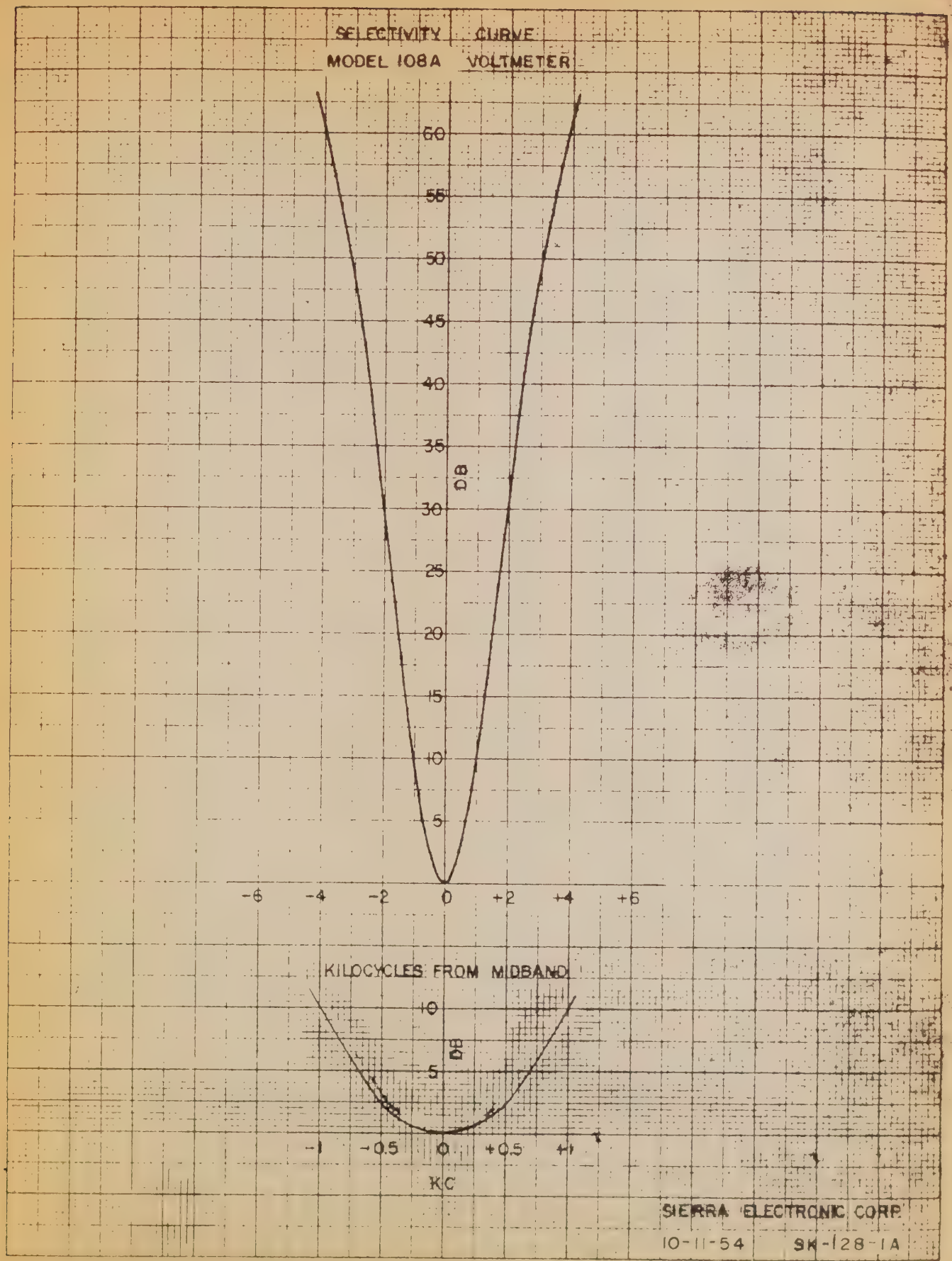

SELECTIVITY CURVE
MODEL 108A VOLTMETER
60
55
50
45
40
35
30
25
20
15
10
5
DB
-6
-4
-2
0
+2
+4
+6
KILOCYCLES FROM MIDBAND
10
5
DB
-1
-0.5
0
+0.5
+1
KC
SIERRA ELECTRONIC CORP
10-11-54
SK-128-1A

FIG. 4

Schem. Ref. No.	Description	Sierra Stock No.	Mfgr.	Designation
C1	Ceramic 1.5-7 mmf 500Vdcw zero coeff	32A070	Erie	TS2A, NPO
C2	Ceramic 1.5-7 mmf 500Vdcw zero coeff	32A070	Erie	TS2A, NPO
C3	Paper tubular 0.1 mf ±20% 400Vdcw	10B104	Sangamo	300401
C4	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C5	Adjustable air 0.1 -1.0 mmf		Sierra	SU-5168-1
C6	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C7	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C8	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C9	Mica .0001 mf ±10% 500Vdcw	16K101	El-Menco	CM19B101
C10	Mica .001 mf ±10% 500Vdcw	16K102	El-Menco	CM19B102
C11	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C12	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C13	Paper tubular 0.1 mf ±20% 400Vdcw	10B104	Sangamo	300401
C14	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C15	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C16	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C17	Mica .001 mf ±10% 500Vdcw	16K102	El-Menco	CM-19B102
C18	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C19	Mica .00025 mf ±10% 500Vdcw	16K251	El-Menco	CM19B251
C20	Mica .001 mf ±10% 500Vdcw	16K102	El-Menco	CM19B102
C21	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C22	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C23	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C24	Mica 50 mmf ±10% 500Vdcw	16K500	El-Menco	CM19B500
C25	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C26	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C27	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C28	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C29	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C30	Mica .001 mf ±10%, 500Vdcw	16K102	El-Menco	CM19B102
C31	Ceramic .02 -02 mf 500Vdcw disc	14A203	Sprague	5HK-2S2
C32	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C33	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C34	Ceramic 4-30 mmf 500Vdcw neg coeff	32A300	Erie	TS2A-N650
C35	Air 52.6 mmf nom	28X530	Sierra	
C36	Electrolytic 20-20-20 mf 450Vdcw	22B206	Sangamo	PLT-4520
C37	Paper tubular 0.1 mf ±20% 400Vdcw	10B104	Sangamo	300401

Electrical Parts List for Schematic Daigram No. E-4286-4

CARRIER FREQUENCY VOLTMETER, MODEL 108A

Schem. Ref. No.	Description	Sierra Stock No.	Mfgr.	Designation
C38	Mica .003 mf ±2% 500Vdcw	20G302	El-Menco	CM30E302G
C39	Mica .003 mf ±2% 500Vdcw	20G302	El-Menco	CM30E302G
C40	Mica 50 mmf ±2% 500Vdcw	20G500	El-Menco	CM15E500G
C41	Mica .001 mf ±10% 500Vdcw	16K102	El-Menco	CM19B102
C42	Ceramic 47 mmf ±5% 500Vdcw neg coeff	14X470	Erie	N750K47±2.35
C43	Paper tubular 0.1 mf ±10% 400Vdcw	10X104	Sangamo	300401
C44	Paper tubular 0.1 mf ±10% 400Vdcw	10X104	Sangamo	300401
C45	Mica .0001 mf ±10% 500Vdcw	16K101	El-Menco	CM19B101
C46	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C47	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C48	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
C49	Paper tubular .01 mf ±20% 400Vdcw	10A103	Sangamo	300411
BP1	Binding Post Assembly (Pair)	152X1	Millen	37222, 37202
BP2	Binding Post Assembly (Pair)	152X2	Millen	37222, 37202
D1	Germanium Diode 1N34	105X1N34	Sylvania	1N34
F1	Fuse 2 amp type 3AG	132X1	Littlefuse	312002
I1	6-8 volt 0.15 amp T3-1/4 bulb	138X1	Nat'l Union	N47
J1	Plain	144X3	Switchcraft	11-JAX
L1	Fixed 2.5 mh ±3%	90X4	Sierra	
L2	Not Used			
L3	Variable 27-45 mh	94X4	Sierra	
L4	Variable 190-225 mh	94X5	Sierra	
L5	Fixed 360 max dc ohms 50 ma	92X2	Sierra	
L6	Fixed 2.5 mh ±3%	90X4	Sierra	
L7	Fixed 2.5 mh ±3%	90X4	Sierra	
L8	Fixed 100 mh ±3%	90X5	Sierra	
L9	Fixed 150 mh ±3%	90X6	Sierra	
M1	200 ma 400 ohms	118X4	Weston or Burlington	SS-4659-1
PL1	#18/3 type SJ, 10' 6" 3 wire	164X2		

Electrical Parts List for Schematic Diagram No. S-4283-4

CARRIER FREQUENCY VOLTMETER, MODEL 108A

Schem. Ref. No.	Description	Sierra Stock No.	Mfgr.	Designation
R1	4,700 ohms ±10% 1/2 watt	52X472	A.B.	Type EB
R2	250,000 ohms ±10% 2 watt	79X9	Sierra	
R3	82 ohms ±10% 1/2 watt	52X820	A.B.	Type EB
R4	22,000 ohms ±10% 1/2 watt	52X223	A.B.	Type EB
R5	33,000 ohms ±10% 2 watt	60X333	A.B.	Type HB
R6	10,000 ohms ±10% 1/2 watt	52X103	A.B.	Type EB
R7	100 ohms ±10% 1/2 watt	52X101	A.B.	Type EB
R8	220,000 ohms ±10% 1/2 watt	52X224	A.B.	Type EB
R9	2,200 ohms ±10% 1/2 watt	52X222	A.B.	Type EB
R10	680 ohms ±10% 1/2 watt	52X681	A.B.	Type EB
R11	5,000 ohms ±10% 2 watt	79X10	Sierra	
R12	82,000 ohms ±10% 1/2 watt	52X823	A.B.	Type EB
R13	100,000 ohms ±10% 1/2 watt	52X104	A.B.	Type EB
R14	10,000 ohms ±10% 1/2 watt	52X103	A.B.	Type EB
R15	56,000 ohms ±10% 1/2 watt	52X563	A.B.	Type EB
R16	27,000 ohms ±5% 1 watt	54X273	A.B.	Type EB
R17	10,000 ohms ±10% 1/2 watt	52X103	A.B.	Type EB
R18	100,000 ohms ±10% 1/2 watt	52X104	A.B.	Type EB
R19	4,700 ohms ±10% 1/2 watt	52X472	A.B.	Type EB
R20	470,000 ohms ±10% 1/2 watt	52X474	A.B.	Type EB
R21	10,000 ohms ±10% 1/2 watt	52X103	A.B.	Type EB
R22	10,000 ohms ±10% 1/2 watt	52X103	A.B.	Type EB
R23	47,000 ohms ±5% 1/2 watt	50X473	A.B.	Type EB
R24	150,000 ohms ±10% 1/2 watt	52X154	A.B.	Type EB
R25	1,000,000 ohms ±10% 2 watt	79X11	Sierra	
R26	2,200 ohms ±10% 1/2 watt	52X222	A.B.	Type EB
R27	100,000 ohms ±10% 1/2 watt	52X104	A.B.	Type EB
R28	100,000 ohms ±1% 1/2 watt	74X9	Electra	DC-1/2
R29	100,000 ohms ±10% 1/2 watt	52X104	A.B.	Type EB
R30	1,500 ohms ±10% 1/2 watt	52X152	A.B.	Type EB
R31	100 ohms ±10% 1/2 watt	52X101	A.B.	Type EB
R32	220,000 ohms ±10% 1/2 watt	52X224	A.B.	Type EB
R33	1,000 ohms ±10% 1/2 watt	52X102	A.B.	Type EB
R34	1,000 ohms ±10% 1/2 watt	52X102	A.B.	Type EB
R35	1,000 ohms ±10% 1/2 watt	52X102	A.B.	Type EB
R36	47,000 ohms ±10% 1/2 watt	52X473	A.B.	Type EB
R37	2,200 ohms ±10% 1/2 watt	52X222	A.B.	Type EB
R38	1,000,000 ohms ±10% 1/2 watt	52X105	A.B.	Type EB
R39	25,000 ohms ±10% 10 watt	64X253	Model Engr.	FRL-10
R40	39,000 ohms ±10% 1 watt	56X393	A.B.	Type GB
R41	39 ohms ±10% 1/2 watt	52X390	A.B.	Type EB
R42	2,500 ohms ±10% 2 watt	79X12	Sierra	

Electrical Parts List for Schematic Diagram No. E-4296-4

CARRIER FREQUENCY VOLTMETER, MODEL 108A

Schem. Ref. No.	Description	Sierra Stock No.	Mfgr.	Designation
R43	1,000,000 ohms ±10% 1/2 watt	52X105	A.B.	Type EB
R44	56,000 ohms ±10% 1/2 watt	52X563	A.B.	Type EB
R45	25,000 ohms ±10% 2 watt	79X34	Sierra	
R46	3,950 ohms ±1% 1/2 watt	74X28	Electra	DC-1/2
R47	1.081 ohms ±1% 1/2 watt	74X7	Electra	DC-1/2
R48	341.9 ohms ±1% 1/2 watt	74X6	Electra	DC-1/2
R49	108.1 ohms ±1% 1/2 watt	74X5	Electra	DC-1/2
R50	34.19 ohms ±1% 1/2 watt	74X4	Electra	DC-1/2
R51	10.81 ohms ±1% 1/2 watt	74X3	Electra	DC-1/2
R52	3.419 ohms ±1% 1/2 watt	74X2	Electra	DC-1/2
R53A	3.162 ohms ±1% 1/2 watt	74X1	Electra	DC-1/2
R53B	3.162 ohms ±1% 1/2 watt	74X1	Electra	DC-1/2
R54	7,110 ohms ±1% 1/2 watt	74X11	Electra	DC-1/2
R55	9,625 ohms ±1% 1/2 watt	74X12	Electra	DC-1/2
R56	9,625 ohms ±1% 1/2 watt	74X12	Electra	DC-1/2
R57	24,750 ohms ±1% 1/2 watt	74X13	Electra	DC-1/2
R58	6,110 ohms ±1% 1/2 watt	74X10	Electra	DC-1/2
R59	6,110 ohms ±1% 1/2 watt	74X10	Electra	DC-1/2
R60	79,000 ohms ±1% 1/2 watt	74X14	Electra	DC-1/2
R61	5,325 ohms ±1% 1/2 watt	74X9	Electra	DC-1/2
R62	5,325 ohms ±1% 1/2 watt	74X9	Electra	DC-1/2
R63	1,000,000 ohms ±10% 1/2 watt	52X105	A.B.	Type EB
SW1	Switch, rotary 4 pole 3 position 2 sections	112X13	Sierra	
SW2	Not Used			
SW3	Part of R25			
SW4	Switch, rotary 3 pole 11 position 3 sections	112X1	Sierra	
SW5	Switch, toggle SPDT 3A 250V	110X3	AH & H	21350
T1	Transformer I.F. 1110 kc	98X5	Sierra	
T2	Transformer I.F. 1110 kc	98X5	Sierra	
T3	Transformer I.F. 1110 kc	98X5	Sierra	
T4	Transformer I.F. 82 kc	98X3	Sierra	
T5	Transformer I.F. 82 kc	98X3	Sierra	
T6	Transformer plate and filament 50/60 cps	100X3	Sierra	
T7	Transformer line bridging 15 to 500 kc	Mod. 146	Sierra	

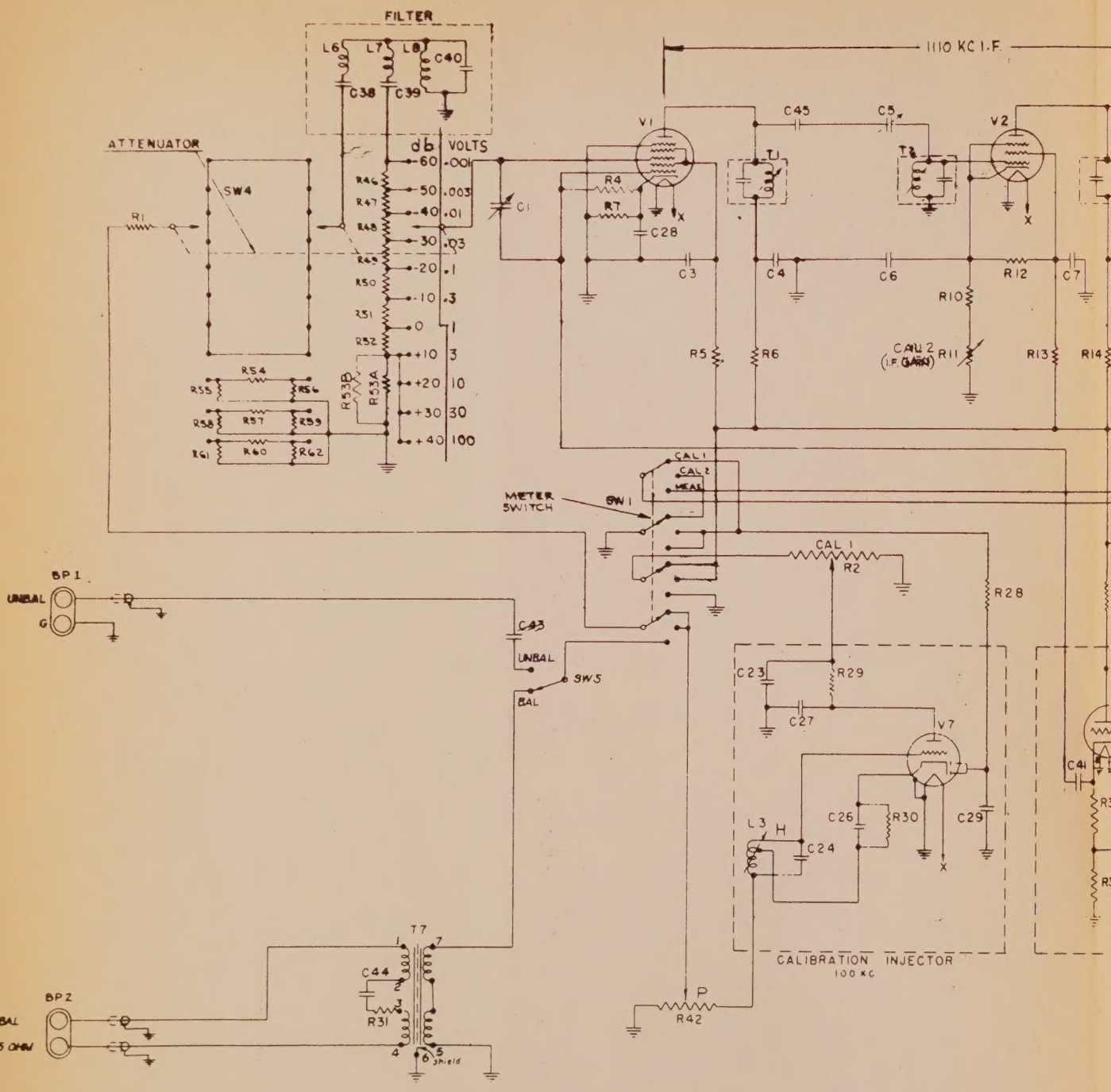
Electrical Parts List for Schematic Diagram No. [illegible]

CARRIER FREQUENCY VOLTMETER, MODEL 108A

Schem. Ref. No.	Description	Sierra Stock No.	Mfgr.	Description
V1	6SB7Y Vacuum tube	107X6SB7Y		
V2	6SK7 Vacuum tube	107X6SK7		
V3	6SB7Y Vacuum tube	107X6SB7Y		
V4	6SJ7 Vacuum tube	107X6SJ7		
V5	6J5 Vacuum tube	107X6J5		
V6	6J5 Vacuum tube	107X6J5		
V7	6SQ7 Vacuum tube	107X6SQ7		
V8	6SN7-GT Vacuum tube	107X6SN7GT		
V9	5Y3-GT Vacuum tube	107X5Y3GT		
V10	6Y6-G Vacuum tube	107X6Y6-G		
V11	6SJ7 Vacuum tube	107X6SJ7		
V12	OB2 Vacuum tube	107XOB2		
Y1	Crystal Quartz 1028.0 kc ±.02%	122X1	Sierra	

Electrical Parts List for Schematic Diagram No. 54286-41

CARRIER FREQUENCY VOLTMETER, MODEL 108A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L7
L8
C40
C38
C39
1110 KC I.F.
ATTENUATOR
db
VOLTS
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.03
.1
.3
1
3
10
30
100
SW4
R1
R46
R47
R48
R49
R50
R51
R52
R53B
R53A
R54
R55
R56
R58
R57
R59
R61
R60
R62
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+10
+20
+30
+40
V1
C45
C5
V2
T1
T2
C1
R4
R7
C28
C3
C4
C6
R12
C7
R10
R5
R6
CAL 2
(I.F. GAIN)
R11
R13
R14
METER
SWITCH
SW1
CAL 1
CAL 2
MEAS
BP1
UNBAL
G
C43
UNBAL
SW5
BAL
CAL 1
R2
R28
C23
R29
C27
V7
C41
C26
R30
C29
L3
H
C24
X
CALIBRATION INJECTOR
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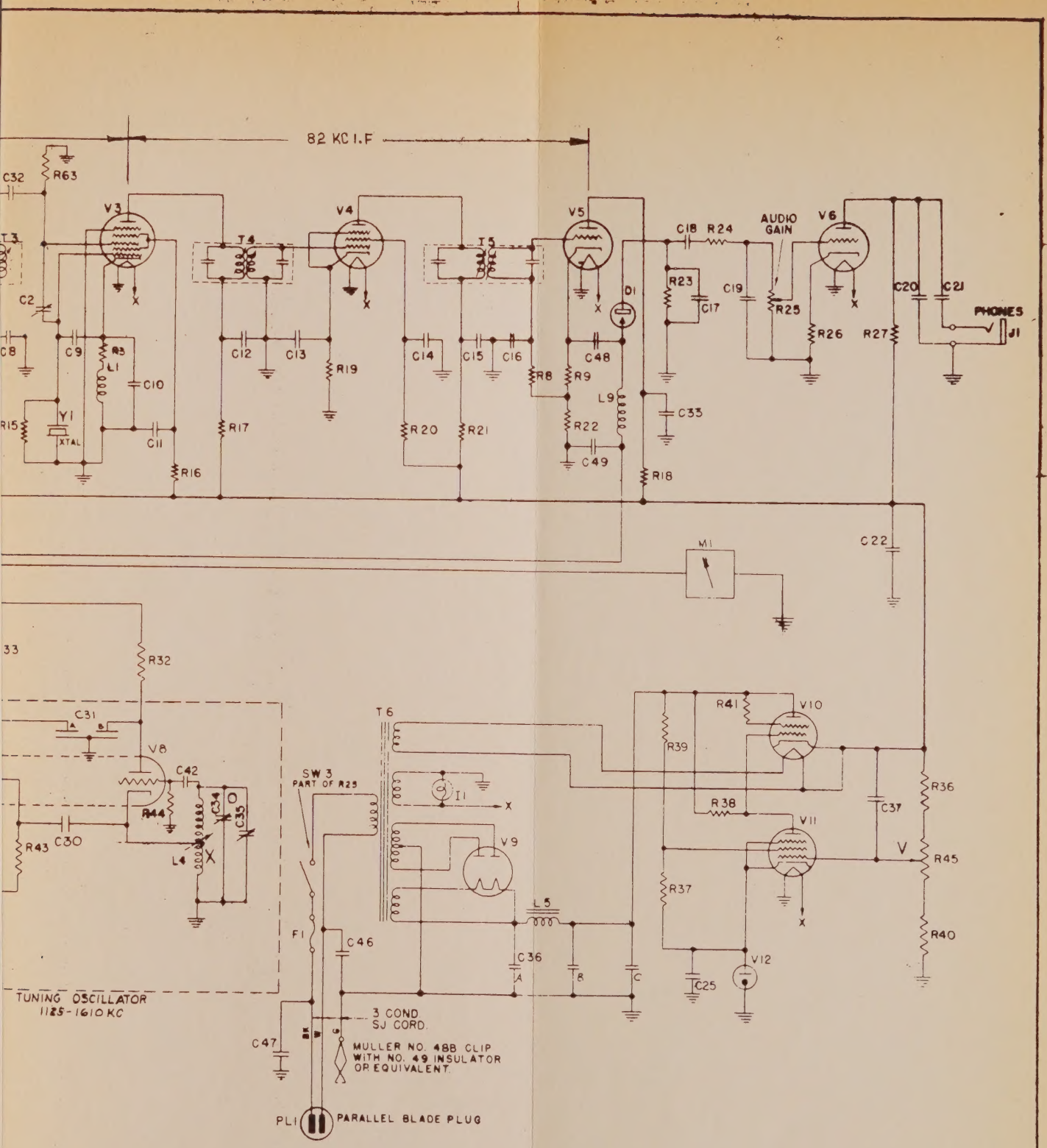
7
C44
R31
4
6
5
Shield
BP2
BAL
135 OHM
P
R42



LAST RESIST. AND CAPAC. USED IN THIS DWG.	
R63	C49

CARRIER FREQUENCY VOLTMETER
108A

Sierra Electronic Corp
SAN CARLOS, CALIFORNIA

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